

# High-Speed M Series Multifunction DAQ – 16-Bit, up to 1.25 MS/s, up to 80 Analog Inputs

## NI M Series – High-Speed

- NI recommends high-accuracy M Series for 5X more measurement sensitivity and lowpass filtering
- 16, 32, or 80 analog inputs at 16 bits, 1.25 MS/s (1 MS/s scanning<sup>1</sup>)
- Up to 4 analog outputs at 16 bits, 2.8 MS/s (2  $\mu$ s full-scale settling)
- 7 programmable input ranges ( $\pm 100$  mV to  $\pm 10$  V) per channel
- Up to 48 TTL/CMOS digital I/O lines (up to 32 hardware-timed at 10 MHz)
- Two 32-bit, 80 MHz counter/timers
- Analog and digital triggering
- NI-MCal calibration technology for improved measurement accuracy
- 6 DMA channels for high-speed data throughput
- 4 USB signal streams for high-speed data transfer
- 2-year calibration interval
- 3-year warranty with device registration

<sup>1</sup>NI 6255 specified at 750 KS/s scanning.

### Operating Systems

- Windows 2000/XP<sup>2</sup>
- Mac OS X
- Linux<sup>®</sup>

### Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio
- SignalExpress

### Other Compatible Software

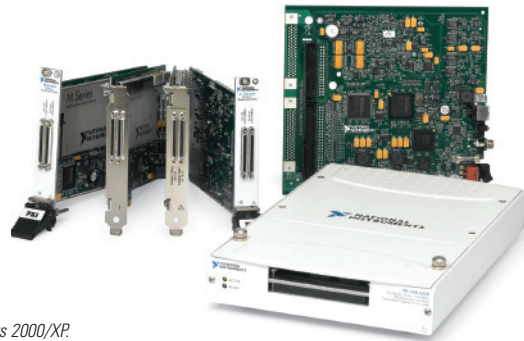
- VI Logger
- Visual Studio .NET
- C/C++/C#
- Visual Basic

### Measurement Services Software (included)<sup>3</sup>

- NI-DAQmx driver software
- Measurement & Automation Explorer configuration utility
- VI Logger Lite data-logging software

<sup>2</sup>USB devices and PXI Express supported only in Windows 2000/XP.

<sup>3</sup>Mac OS X users must download NI-DAQmx Base driver.



Family	Bus	Analog Inputs	Analog Input Resolution (bits)	Analog Outputs	Analog Output Resolution (bits)	Max Output Rate (MS/s)	Analog Output Range (V)	Digital I/O	Correlated (clocked) DIO
NI 6250	PCI, PXI	16	16	0	–	–	–	24	8, up to 10 MHz
NI 6251 <sup>1</sup>	USB, PCI Express, PCI, PXI Express, PXI	16	16	2	16	2.8	$\pm 10, \pm 5, \pm \text{ext ref}$	24	8, up to 10 MHz <sup>2</sup>
NI 6254	PCI, PXI	32	16	0	–	–	–	48	32, up to 10 MHz
NI 6255	PCI, PXI	80	16	2	16	2.8	$\pm 10, \pm 5, \pm \text{ext ref}$	24	8, up to 10 MHz <sup>2</sup>
NI 6259 <sup>1</sup>	USB, PCI Express, PCI, PXI Express, PXI	32	16	4	16	2.8	$\pm 10, \pm 5, \pm \text{ext ref}$	48	32, up to 10 MHz <sup>2</sup>

<sup>1</sup>USB devices are not compatible with SCXI signal conditioning.

<sup>2</sup>USB devices can clock DIO up to 1 MHz across the bus and up to 10 MHz using onboard regeneration.

Table 1. High-Speed M Series Selection Guide

## Overview and Applications

National Instruments M Series high-speed multifunction data acquisition (DAQ) devices are optimized for superior accuracy at fast sampling rates. They have an onboard NI-PGIA 2 amplifier designed for fast settling times at high scanning rates, ensuring 16-bit accuracy even when measuring all channels at maximum speeds. All high-speed devices have a minimum of 16 analog inputs, 24 digital I/O lines, seven programmable input ranges, analog and digital triggering, and two counter/timers. All M Series devices are available with a 3-year warranty for a limited time. By registering your M Series DAQ device, you can add 2 years of warranty service to the standard 1-year warranty. High-speed M Series devices have an extended 2-year calibration interval.

## M Series for Test

For test, you can use M Series high-speed analog inputs and 10 MHz digital lines in conjunction with NI signal conditioning for applications including electronics test, component characterization, and sensor measurements. High-speed M Series devices are compatible with National Instruments SCC and SCXI signal conditioning platforms, which provide amplification, filtering, and power for virtually every type of sensor. These platforms also are compliant with IEEE 1451.4 smart transducer electronic data sheet (TEDS) sensors, which provide digital storage for sensor data sheet information. For improved accuracy, high-accuracy M Series devices are recommended in test applications. Your tests can benefit from the high-accuracy M Series 18-bit ADC

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for a 4X increase in resolution and onboard lowpass filters for 5X more measurement sensitivity.

### M Series for Control

M Series digital lines can drive 24 mA for relay and actuator control. By clocking the digital lines as fast as 10 MHz, you can use these lines for pulse-width modulation (PWM) to control valves, motors, fans, lamps, and pumps. With four waveform analog outputs, two 80 MHz counter/timers, and six DMA channels, M Series devices can execute multiple control loops simultaneously. High-speed M Series devices also have direct support for quadrature encoder measurements, protected digital lines, and digital debounce filters for control applications. With up to 80 analog inputs, 32 clocked digital lines, and four analog outputs, you can execute multiple control loops with a single device. For higher-count control loops, you can use M Series devices in conjunction and tightly synchronized with National Instruments analog output devices for 64 or more loops. With the NI SoftMotion Development Module for LabVIEW, you can create a complete custom motion controller with M Series devices.

### M Series for Design

You can use the wide range of I/O – from 80 analog inputs to 48 digital lines – to measure and verify prototype designs. M Series devices and National Instruments SignalExpress interactive measurement software bring benchtop measurements to the PC. With NI SignalExpress interactive configuration-based steps, you can quickly create design verification tests. The fast acquisition and generation rates of high-speed M Series devices along with SignalExpress provide on-the-fly design analysis. You can convert your tested and verified SignalExpress projects to NI LabVIEW applications for immediate M Series DAQ use, thus bridging the gap between test, control, and design applications.

### M Series Performance on PCI Express

National Instruments was the first company to empower engineers and scientists to use the PCI Express and PXI Express buses for data acquisition. PCI Express M Series devices contain six DMA channels to maximize data throughput without using PC processing time. The PCI Express bus delivers the highest bandwidth compared to any other PC bus, and it eliminates throughput bottlenecks by providing 250 MB/s per-direction bandwidth across the x1 (“by one”) lane for increased data transfer. Each slot allocates dedicated bandwidth, meaning that multiple PCI Express boards do not share bandwidth for data transfer. With this improvement over the shared-bandwidth PCI architecture, all onboard I/O runs simultaneously while data is transferred to and from PC memory across the bus. The PXI Express specifications

integrate PCI Express signaling into the PXI Standard, which increases backplane bandwidth from 132 MB/s to 6 GB/s, a 45 times improvement. Both PCI Express and PXI Express facilitate a smooth transition to new hardware by providing backward compatibility to software written for applications that use PCI or PXI, respectively.

### M Series Performance on USB

With recent speed and bandwidth improvements, USB has evolved into a core bus of choice for measurement and automation applications. USB adds portability and ease of use with plug-and-play compatibility. With USB M Series, you can deliver a high-performance portable system using an available USB port on a laptop computer and other portable computing platforms. NI designed a new and innovative patent-pending signal streaming technology with which you can sustain four high-performance data streams over USB. This new technology greatly improves overall USB data acquisition performance by providing high-speed data paths for USB control and data transfer. USB M Series modules are available with built-in screw terminals, mass terminals, or OEM board-only versions.

### Hybrid-Slot-Compatible PXI Modules

PXI M Series modules are hybrid-slot-compatible so that you can use them in both PXI slots and the hybrid slots found in new PXI Express chassis. The PXI Systems Alliance specifies that hybrid-slot-compatible PXI modules use modified slot connectors to mechanically fit in both PXI slots and hybrid slots. This mechanical change:

- Provides compatibility to past, current, and future PXI chassis
- Maintains existing product specifications
- Requires no software changes (application or driver)
- Maintains speed and capability of all PXI communication (PXI Express signaling is not provided)

However, hybrid-slot-compatible PXI modules do not include the pins used to implement PXI local bus communication, which is used for backplane SCXI control from the right most PXI slot in PXI/SCXI combination chassis (PXI-1010, PXI-1011, PXI-1050, and PXI-1052). For these applications, NI provides unmodified PXI M Series modules that maintain the required local bus capabilities. Refer to the SCXI Control of PXI/SCXI Combination Chassis section within Ordering Information for part numbers.

### Simultaneous and Intelligent Data Acquisition

When you need to obtain performance from a data acquisition device beyond the capabilities of a multifunction DAQ device, National Instruments provides simultaneous sampling with S Series and intelligent DAQ with R Series. The S Series architecture dedicates an ADC per channel to provide higher aggregate sampling rates compared to multiplexed devices.

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S Series devices are ideal for applications including IF digitization, transient recording, ultrasound and sonar testing, and high-energy physics.

The multifunction R Series data acquisition devices contain a 1M/3M gate FPGA that is reconfigurable using the NI LabVIEW FPGA Module. Multifunction R Series devices have up to eight independent 16-bit analog inputs with up to 200 kHz simultaneous sampling, up to eight independent 16-bit analog outputs with up to 1 MHz simultaneous update rates, and up to 96 digital I/O lines configurable at rates up to 40 MHz. You can customize these devices to develop capabilities such as complete control over the synchronization and timing of all signals and operations; user-defined onboard decision-making logic; and digital lines individually configurable as input, output, counter/timers, PWM, flexible encoder inputs, or user-defined communication protocols.

### Recommended Accessories

Signal conditioning is required for sensor measurements or voltage inputs greater than 10 V. NI SCXI is a versatile, high-performance signal conditioning platform optimized for high-channel-count applications. NI SCC provides portable, flexible signal conditioning options on a per-channel basis. Visit [ni.com/sigcon](http://ni.com/sigcon) for resources on available NI signal conditioning. For applications that do not require signal conditioning, refer to Table 2 for recommended cabling and accessories.

### Recommended Training and Services

All M Series devices are available with a 3-year warranty for a limited time. By registering your M Series DAQ device, you can add 2 years of warranty service to the standard 1-year warranty. To maintain

measurement accuracy, NI offers calibration services to prolong device accuracy and meet your quality requirements.

For new data acquisition programmers, NI recommends the “Data Acquisition: 7 Steps to Success Tutorial Kit.” This tutorial kit helps shorten development time for data acquisition applications by describing the various stages of getting started with data acquisition applications including system definition, setup, test, and application programming.

### Recommended Software

National Instruments measurement services software, built around NI-DAQmx driver software, includes intuitive application programming interfaces, configuration tools, I/O assistants, and other tools designed to reduce system setup, configuration, and development time. National Instruments recommends using the latest version of NI-DAQmx driver software for application development in National Instruments LabVIEW, LabWindows/CVI, and Measurement Studio. To obtain the latest version of NI-DAQmx, visit [ni.com/support/daq/versions](http://ni.com/support/daq/versions). Mac OS X users can program M Series devices with NI-DAQmx Base driver software. M Series devices are compatible with the following versions (or later) of NI application software – LabVIEW, LabWindows/CVI, or Measurement Studio versions 7.x; SignalExpress 1.x; VI Logger 2.0; or LabVIEW with the LabVIEW Real-Time Module 7.1. M Series devices are not compatible with the Traditional NI-DAQ (Legacy) driver.

M Series	Feature	Connect to . . .	Connector <sup>1</sup>	Cable <sup>2</sup>	Cable Adapter	Accessory <sup>3</sup>
PCI, PXI, PCI Express, and PXI Express devices	Noise-reducing	SCC portable signal conditioning	0 or 1	SHC68-68-EPM	–	See <a href="http://ni.com/sigcon">ni.com/sigcon</a> or SCC-68
	Noise-reducing	SCXI high-performance signal conditioning	0 only	SHC68-68-EPM	–	See <a href="http://ni.com/sigcon">ni.com/sigcon</a>
	Noise-reducing	Screw terminals	0 or 1	SHC68-68-EPM	–	SCC-68, SCB-68, or TBX-68
	Noise-reducing	Screw terminals (PXI only)	0 only	–	–	TB-2706
	Noise-reducing	BNC terminal block	0 or 1	SHC68-68-EPM	–	BNC-2110, BNC-2111, BNC-2120, or BNC-2090
	Noise-reducing	50-pin connector	0 or 1	SHC68-68-EPM	68M-50F-MIO	Custom-built or third-party
	Basic shielding	Screw terminals	0 or 1	SHC68-68	–	SCB-68, CB-68LP, or CB-68LPR
	Low-cost	Screw terminals	0 or 1	RC68-68	–	CB-68LP or CB-68LPR
	Custom connectivity	Board mounting connectors	0 or 1	SHC68-68-EPM	–	PCB mounting connectors
	Custom connectivity	68-pin female connector	0 or 1	SHC68-68M-EPM	–	Custom-built or third-party
USB devices	Custom connectivity	Unterminated	0 or 1	SHC68-NT-S	–	Custom-built or third-party
	Noise-reducing	SCC portable signal conditioning	0 or 1	SH68-68-EP	–	See <a href="http://ni.com/sigcon">ni.com/sigcon</a> or SCC-68
	Noise-reducing	Screw terminals	0 or 1	SH68-68-EP	–	SCC-68, SCB-68, or TBX-68
	Noise-reducing	BNC terminal block	0 or 1	SH68-68-EP	–	BNC-2110, BNC-2111, BNC-2120, or BNC-2090
	Low-cost	Screw terminals	0 or 1	SH68-68-EP	–	CB-68LP or CB-68LPR

<sup>1</sup>Connector 0 is found on all M Series devices. 0 and 1 require two cables and accessories and are available on NI 6254, NI 6255, and NI 6259 devices.

<sup>2</sup>For NI 6255, use SHC68-68-EPM on connector 0 and SHC68-68 on connector 1.

<sup>3</sup>For NI 6255 screw-terminal connectivity, use SCC-68 for connector 0 and SCB-68 for connector 1.

Table 2. Recommended Accessories

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## Ordering Information

### USB

NI USB-6251	
Screw terminal .....	779627-0P <sup>1</sup>
Mass terminal .....	779694-0P <sup>1</sup>
OEM board-only kit .....	194929-03
OEM board-only kit (Qty 10).....	779761-01
NI USB-6259	
Screw terminal .....	779628-0P <sup>1</sup>
Mass terminal.....	779695-0P <sup>1</sup>
OEM board-only kit .....	194929-01
OEM board-only kit (Qty 10).....	779762-01

<sup>1</sup>P is 1 (U.S. 120 VAC); 2 (Swiss 220 VAC); 3 (Australian 240 VAC); 4 (Universal Euro 240 VAC); 6 (UK 240 VAC); 7 (Japanese 100 VAC)

### PCI

NI PCI-6250.....	779069-01
NI PCI-6251.....	779070-01
NI PCI-6254.....	779071-01
NI PCI-6255.....	779546-01
NI PCI-6259.....	779072-01

### PXI

NI PXI-6250.....	779116-01
NI PXI-6251.....	779631-01
NI PXI-6254.....	779118-01
NI PXI-6255.....	779547-01
NI PXI-6259.....	779632-01

### PXI (SCXI Control in PXI/SCXI Combination Chassis)

NI PXI-6251.....	779117-01
NI PXI-6259.....	779119-01

### PCI Express

NI PCIe-6251.....	779512-01
NI PCIe-6259.....	779513-01

### PXI Express

NI PXIe-6251.....	779777-01
NI PXIe-6259.....	779778-01

### Data Acquisition Services

Data Acquisition: 7 Steps to Success .....	779489-01
Detailed Calibration Services	
PCI.....	960437-01
PCI Express/PXI/PXI Express .....	960439-01
Basic Calibration Service .....	960438-01

*Includes data acquisition driver software.*

## BUY NOW!

For complete product specifications, pricing, and accessory information, call (800) 813 3693 (U.S.) or go to [ni.com/daq](http://ni.com/daq).

# NI Services and Support



NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit [ni.com/services](http://ni.com/services).

## Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit [ni.com/training](http://ni.com/training).

## Professional Services

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and

integrators. Services range from start-up assistance to turnkey system integration.

Visit [ni.com/alliance](http://ni.com/alliance).



## OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit [ni.com/oem](http://ni.com/oem).

## Local Sales and Technical Support

In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at [ni.com/support](http://ni.com/support).

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit [ni.com/ssp](http://ni.com/ssp).

## Hardware Services

### NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with [ni.com/pxiadvisor](http://ni.com/pxiadvisor).

### Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

### Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit [ni.com/services](http://ni.com/services).



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